의학석사 학위논문

유두-유륜 복합체의 재건에서 돌출도 유지를 위해 고안된 변형된 C-V 피판술 및 쌈지 봉합을 이용한 새로운 수술법

A New Method for Nipple-Areolar Complex (NAC) Reconstruction Using Modified C-V Flap with Purse-String Suture to Maintain Nipple Projection

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이 논문을 의학석사 학위논문으로 제출함

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윤미영

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2020 년 7 월

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Abstract

A New Method for Nipple-Areolar Complex (NAC) Reconstruction Using Modified C-V Flap with Purse-String Suture to Maintain Nipple Projection

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Background: Over the years, numerous techniques have emerged for reconstruction of the nipple-areolar complex (NAC). However, the

most common concern after nipple reconstruction is the loss of nipple projection. The objective of this study was to demonstrate a new method for NAC reconstruction based on a modified C-V flap combined with purse-string suture and acellular dermal matrix to maintain nipple projection.

Methods: From January 2018 to April 2019, 32 patients who underwent NAC reconstruction with our new method using a modified C-V flap and the conventional C-V flap were analyzed. The ratio of the initial nipple projection and projection at follow-up was calculated and compared.

Results: There were 13 patients in the modified C-V flap group and 19 in the conventional method group. The 8-month follow-up nipple projection maintenance with the modified C-V flap method was 67.94% in contrast to the 51.51% with the conventional method at the 11-month follow-up ($P < 0.05$).

Conclusions: Nipple reconstruction with a modified C-V flap using

purse-string sutures combined with acellular dermal matrix insertion is an effective method for maintenance of long-term nipple projection owing to reduction and stabilization of the nipple base.

Keywords: Breast reconstruction, Nipple-areolar complex, Acellular dermal matrix, Purse-string suture techniques

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I. Introduction

Reconstruction of the nipple-areolar complex (NAC) represents the final step in breast reconstruction [1]. The final appearance of the NAC has a significant impact on the overall aesthetics of the reconstructed breast [2]. Two basic methods of NAC reconstruction are local flaps and composite grafts. Local flaps are more popular due to the minimal donor site morbidity compared to that with composite grafts. Surgical techniques developed for NAC reconstruction include the C-V flap, star flap, skate flap, bell flap, and arrow flap [3-9]. The C-V flap placement is a simple, quick, and effective method for nipple reconstruction based on a local flap that has been used widely [10]. It is generally performed 3 to 4 months after the breast mound creation (either implant-based or autologous-based) and is generally regarded as an outpatient procedure and potentially performed under local anesthesia [11]. However, dissatisfaction with nipple reconstruction is most commonly owing to the eventual flattening and loss of

projection [12]. The reported average 50% loss of nipple projection noted with a variety of techniques has been discussed in literature [10]. To maintain the projection of the reconstructed nipple over time, various autologous, alloplastic, and allogeneic grafts have been incorporated into the structure of traditional flaps [13]. Recent reports have suggested that acellular dermal matrix in the form of a central pillar helps maintain long-term nipple projection as a relatively solid block that is not reabsorbed after reconstruction [14,15].

In this study, we introduce a new method for NAC reconstruction based on acellular dermal matrix combined with modified C-V flaps.

II. Methods

Records and results were reviewed for 59 patients who underwent NAC reconstruction at our institution with the modified C-V flap method or the conventional C-V flap method from January 2018 to April 2019. We excluded 5 patients who received chemotherapy and radiation therapy and 22 patients who were lost to follow-up, leaving 32 patients for comparison. Nipple projection measurements are presented as mean ± SD. The ratio of the initial nipple projection and projection at follow-up was calculated and compared between groups. Values were compared with a Student's t-test, and a P value < 0.05 was considered significant.

All patients provided informed consent for the procedures and have provided written consent for the publication of data and images.

Operative Technique

All patients were marked for surgery while sitting upright. The position of the C-V flap was marked considering the location of the nipple in the natural breast and whether symmetric surgery was planned on the contralateral side. The flap was also marked to ensure that the blood supply was away from any existing scars. Flaps were composed of two lateral V flaps and a central C-shaped flap (Fig. 1). The diameter of the central C-shaped flap determined the diameter of the new nipple, while the projection was identified by the width of the V flaps. The flap was designed to be slightly larger than the contralateral nipple to allow for shrinkage or reduction in projection occurring over time due to the absorption of the central fat core and to optimize the long-term outcome. The blood supply was maintained from the subdermal plexus from the unincised skin at the base of the C-shaped flap. The V-flap donor sites were closed with 4-0 Monosyn and 5-0 Prolene, leaving the two V flaps and the C flap trapped

externally. Unlike the C-V flap technique, a purse-string suture with 3-0 Prolene was used at the C-flap donor site to reduce the nipple base (Fig. 2). The donor sites were then closed subdermally using 3-0 Monosyn, leaving the two V flaps and the C flap trapped externally. The acellular dermal matrix used in our series was a 1.2×1.2 cm sheet of CGDerm (CGBio Corp., Seungnam, Korea) with a thickness of 3 to 4 mm. The CGDerm was placed into the round defect area for support in order to maintain the projection of the nipple (Fig. 3). A few simple interrupted skin stitches with 6-0 Prolene were used to secure the flaps, and the cross-section of the newly formed nipple resembled an upside down trapezoid.

III. Results

There were 13 patients in the modified C-V flap group and 19 in the conventional method group. Eight patients in the modified C-V flap group had undergone breast reconstruction with a free transverse rectus abdominis myocutaneous (TRAM) flap and 5 had undergone implant-based reconstruction. In the conventional method group, 11 patients had undergone breast reconstruction with a free TRAM flap and 8 patients had undergone implant-based reconstruction. Patient demographic details are shown in Table 1.

The mean initial projection of the nipple was 10.08 ± 1.94 mm in the modified method group. In the conventional method group, the mean initial projection was 8.74 ± 2.05 mm. After an average of 8 months postoperatively, the mean projection in the modified method group was 6.85 ± 2.21 mm. The mean projection in the conventional method group was 4.50 ± 1.46 mm after an average of 11 months postoperatively. In the modified method group, the mean maintenance

of projection was 67.94%. In the conventional method group, the mean maintenance of projection was 51.51% (Table 2).

The Student's t-test showed that there was a statistically significant difference between the conventional method and modified method groups ($P < 0.05$). There were also significant differences between the TRAM flap and implant-based reconstruction groups. No complications, such as flap necrosis, wound dehiscence, or infection, were noted.

Case

A 51-year-old woman was diagnosed with breast cancer and underwent left mastectomy with breast reconstruction using a TRAM flap (Fig. 4). The patient underwent nipple reconstruction using the modified C-V flap technique. Adequate projection of the reconstructed nipple was achieved 8 months after surgery without complications.

IV. Discussion

In breast reconstruction, NAC creation is a critical step. However, the most common problem encountered in nipple reconstruction is the loss of nipple projection [12].

It has been proven that autologous, alloplastic, and allogeneic grafts can provide similarly adequate projection in reconstructed nipples [13]. However, the overall complication rate of allogeneic grafts is lower than that of autologous and alloplastic grafts. As a type of allogeneic material, acellular dermal matrix has a low resorption rate and a high incorporation rate, which helps reduce the risk of infection in contrast to that noted with other materials [16]. Acellular dermal matrix is particularly suitable for NAC reconstruction because it ensures that projection is maintained in long-term follow-up [17].

Although studies have described various methods for NAC reconstruction, local flap placement and composite graft transplantation are still regarded as the basic methods. In the past 30

years, many local flaps and improved designs have been used for NAC reconstruction [18]. Since its development in 1994, local C-V flap placement has become the most commonly used method for simple, quick, and effective nipple reconstruction [10,19]. Several techniques to improve the long-term projection of the reconstructed nipple have been described in literature. Nahabedian [20] was the first to describe the use of acellular dermal matrix in nipple reconstruction with an elongated C flap and a C-V flap resulting in the maintenance of projection of 50%. Additionally, Lee and Ock et al. [21] reported the use of a modified C-V flap with acellular dermal matrix on the base and its fragments inside the nipple column. Although they achieved acceptable maintenance of projection after 1 year (60.58%), several complications including flap necrosis and dehiscence were noted owing to the limited neocapillarization from the nipple base. Some authors have evaluated a technique using acellular dermal matrix as an adjunct to a C-V flap in nipple reconstruction [22, 23]. However,

in these studies, either the maintenance of nipple projection was relatively low (56% in the TRAM flap group; 47% in the expander group) or the follow-up period was short (3 months).

Conversely, with our method using a single acellular dermal matrix as a central core in combination with purse-string suture, the maintenance of nipple projection could be improved without complications. According to our experience, the nipple projection reduces as the base of the nipple gradually widens after conventional reconstruction methods. For this reason, narrowing the base of the nipple, rather than the tip, is more important for creating an ideal omega-shaped nipple as well as maintaining projection. We thus attempted to fill the dead space that occurs at the base of the nipple, and the cross-section of the newly formed nipple resembles an upside-down trapezoid so that its base can prevent the pillar from easily sinking into the breast mound. In addition, we noted that when the flaps were elevated to form the nipple, adjacent tissues tended to

pull the base of the nipple, leading to the loss of projection over time. The novel purse-string suture technique fixes the tissues on the base of the nipple to prevent migration of the nipple base to the periphery of the breast. Furthermore, the degree of overcorrection can be predicted according to the data in this study and future studies.

In a previous study, the loss of nipple projection was noted to occur in the initial 2 months after reconstruction [24]. We therefore assessed projection at an average of 6 months post-reconstruction. It has also been noted that adjuvant chemotherapy and radiation therapy increase the probability of complications after NAC reconstruction, and thus, we excluded these patients from our analysis [25, 26].

Despite the abovementioned strengths, this procedure still has several limitations. In the modified C-V flap method, scars are inevitable after closure of the lateral wings, and some patients were not satisfied with the scars. In addition, there could have been errors or inter-operator variation in post-surgical nipple projection

measurements. Lastly, the follow-up period was different in each group of patients. A larger sample size and longer follow up are needed in the future for more objective data. Although there are several limitations, the modified C-V flap nipple reconstruction technique using purse-string sutures combined with acellular dermal matrix insertion is an effective method for maintenance of long-term nipple projection owing to reduction and stabilization of the nipple base.

Conflict of interest

The authors declare no conflicts of interest.

V. References

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VI. Tables

[Table 1.] Demographic characteristics of nipple areolar complex reconstruction patients

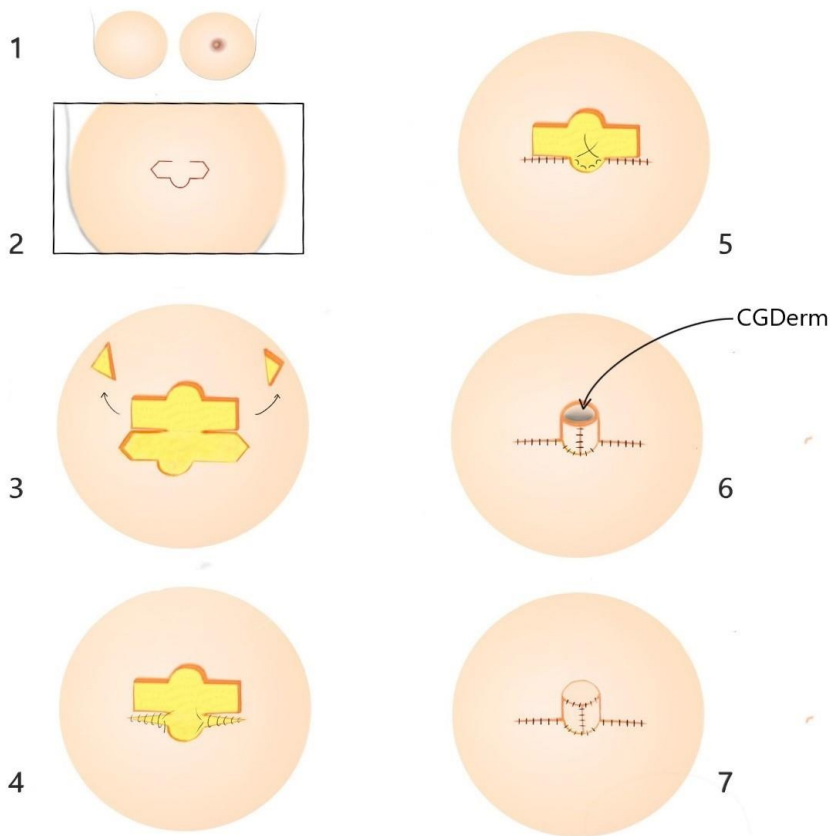
Characteristics	Modified C-V flap method (n = 13)	Conventional method (n = 19)
Mean age (y)	49.5	50.5
Mean follow-up period (mo)	8	11
Reconstruction method	13	19
TRAM flap	8	11
Implant-based	5	8

[Table 2.] Surgical outcomes of the modified C-V flap method and conventional method

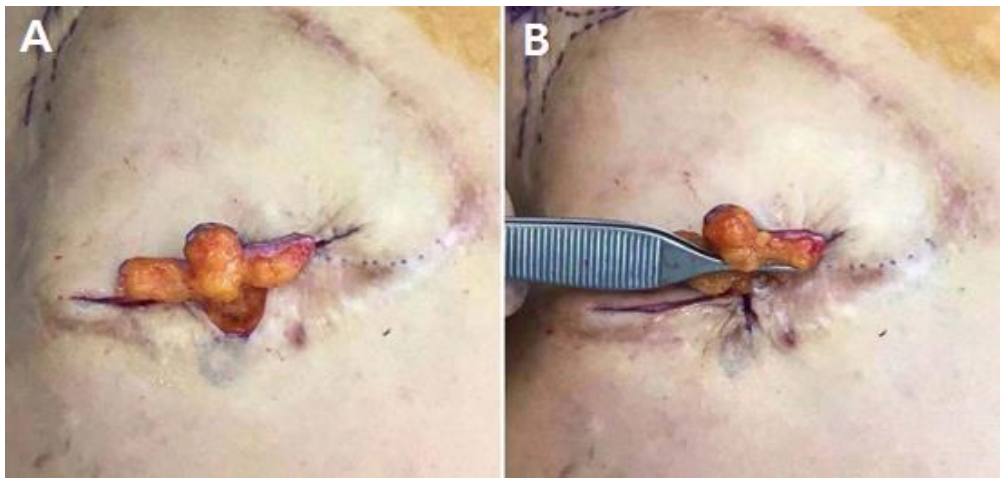
Outcome	Initial projection (mm)	Follow-up projection (mm)	Mean maintenance (%)	P-value
Modified C-V flap method	10.08 ± 1.94	6.85 ± 2.21	67.94%	
Conventional method	8.74 ± 2.05	4.50 ± 1.46	51.51%	0.0010
Modified C-V flap method for TRAM flap	10.13 ± 2.09	7.13 ± 2.26	70.37%	
Conventional method for TRAM flap	8.09 ±2.07	4.68 ± 1.54	57.87%	0.0018
Modified C-V flap method for implant-based reconstruction	10.00 ± 1.67	6.40 ± 2.06	64.00%	
Conventional method for implant-based reconstruction	9.63±1.65	4.25±1.30	44.16%	0.0005
Maintenance = (Follow-up projection) / (Initial projection) x 100 (%)				
Values are presented as mean ± SD or number (%) $P < 0.05$				

VII. Figures

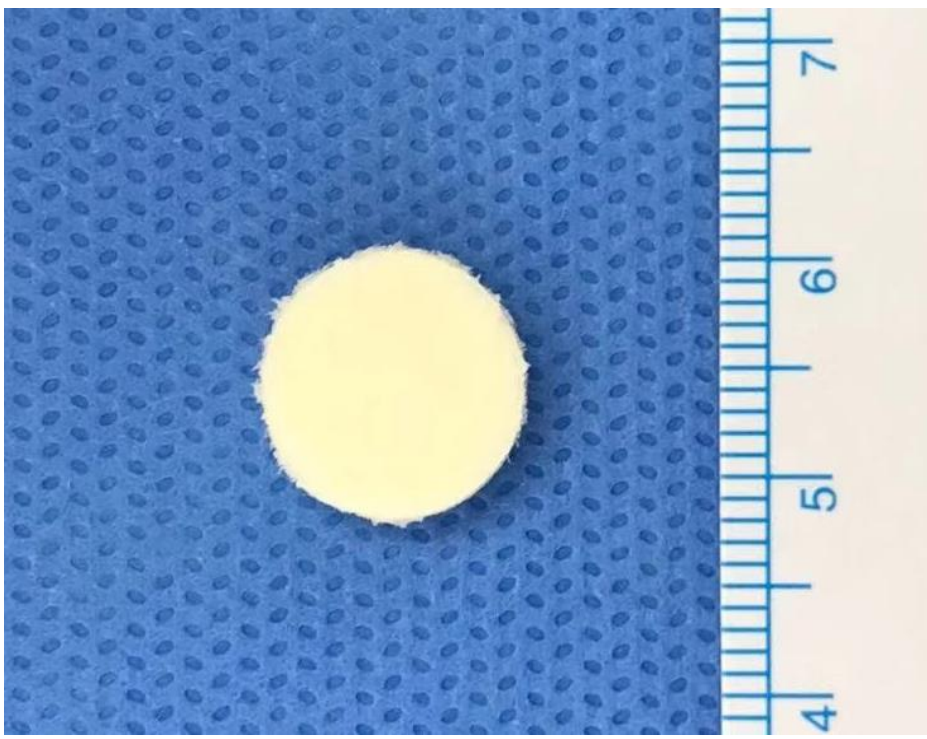
[Fig. 1.] Schema of nipple areolar complex reconstruction



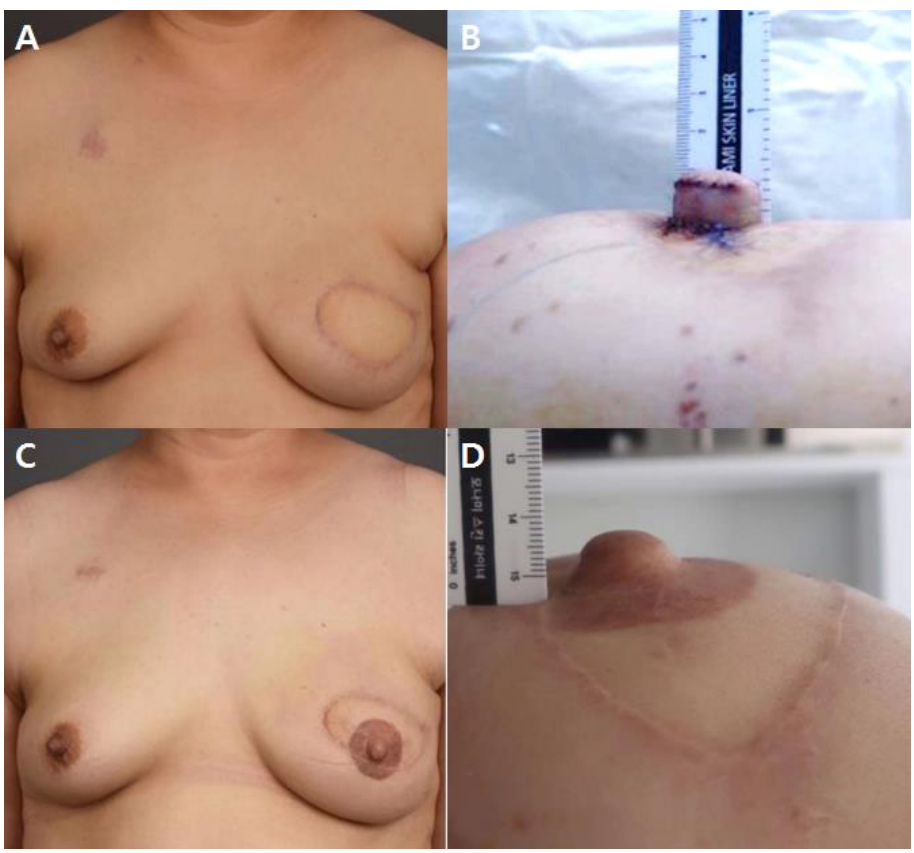
[Fig. 2.] Purse-string suture at the C-flap donor site. (A) Before purse-string suture and (B) after purse-string suture



[Fig. 3.] Acellular dermal matrix disc placement. A 1.2×1.2 cm piece of CGDerm is placed into the round defect area for support in order to maintain the projection of the nipple.



[Fig. 4.] A 51-year-old woman underwent left mastectomy with immediate breast reconstruction using a transverse rectus abdominis myocutaneous flap. (A) Preoperative photographic findings, (B) immediately postoperative photographic findings, (C) postoperative photographic findings at the 8-month follow up after tattooing, and (D) lateral view at the 8-month follow up.



국문초록

유두-유륜 복합체의 재건에서 돌출도 유지를 위해 고안된 변형된 C-V 피판술 및 쌈지 봉합을 이용한 새로운 수술법

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최근 몇 년간, 유두-유륜 복합체의 재건을 위한 다양한 수술법들이 소개된 바 있다. 하지만, 재건 이후의 유두의 돌출도 소실은 여전히 가장 흔한 문제 중의 하나이다. 이에 변형된 C-V 피판술 (Modified C-V flap)에 쌈지 봉합(purse-string suture)과

무세포 진피 이식편(Acellular Dermal matrix)을 이용하여 유두 돌출도를 유지하는 새로운 기술법을 소개하고자 한다. 본 연구는 2018 년 1 월부터 2019 년 4 월까지 시행한 32 명의 유두-유륜 복합체 재건 환자를 대상으로 분석하였다. 환자군은 19 명의 기존 C-V 피판술만을 이용한 환자와 13 명의 새롭게 고안한 변형된 C-V 피판술을 이용하여 재건한 환자를 포함하였으며, 수술 직후의 유두 돌출도와 수술 시행 일정 기간 후 유두 돌출도의 비율을 계산하여 비교하였다. 결과적으로 기존 C-V 피판술을 이용한 환자군의 수술 후 11 개월 뒤 돌출도 유지 비율은 51.51%로 확인되었으고, 변형된 C-V 피판술을 이용한 경우에는 수술 후 8 개월 뒤 67.94%로 확인되었으며 이는 통계적으로 유의한 차이를 보였다. 따라서 본 연구를 통해서, 변형된 C-V 피판술에 쌈지 봉합과 무세포 진피 이식편을 조합하여 재건을 하는 것은 장기적으로 유두 돌출도를 유지시키는데 효율적인 방법으로 사료되며 나아가 더 많은 환자군에서 사용될 수 있기를 기대한다.

주요어: 유방 재건, 유두-유륜 복합체, 무세포 진피 이식편, 쌈지 봉합

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